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Casey Toohey Emcore Corporation
1600 Eubank Boulevard, SE
Albuquerque, NM 87123

EXAMINER

DIAMOND, ALAN D

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 09/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/723,456

Applicant(s)

SHARPS ET AL.

Examiner

Alan Diamond

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on May 23, 2005 and July 5, 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 48-98 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 48-98 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submissions filed on May 23, 2005 and July 5, 2005 have been entered.

Comments

2. The Examiner acknowledges that Applicant has amended the specification so as to recite the patent number for Serial No. 10/280,593.
3. The 35 USC 112, first paragraph, rejection of claim 96 has been overcome by Applicant's removal of the word "substantially".
4. The 35 USC 112, second paragraph, rejection of the claims has been overcome by Applicant's amendment of the claims.
5. All of the obviousness-type and provisional obviousness-type double patenting rejections set forth at sections 17 to 22 of the Final Rejection mailed 02/22/2005 have been overcome by the terminal disclaimers filed May 23, 2005.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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7. Claims 48-98 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 48, at line 5, the recitation "integral to a portion" is not supported by the specification, as originally filed. The same applies to dependent claims 49-51.

In claim 48, at lines 6-7, the term "identical sequences of layers", i.e., plural identical sequences, is not supported by the specification, as originally filed. The same applies to dependent claims 49-51. It is suggested that said term be changed to "an identical sequence of layers".

In claim 48, at line 7, the "substantially the same thickness" limitation is not supported by the specification, as originally filed. The same applies to dependent claims 49-51.

In claim 52, at line 3, the recitation "integral to a portion" is not supported by the specification, as originally filed. The same applies to dependent claims 53-56.

In claim 52, at line 5, the term "identical sequences of layers", i.e., plural identical sequences, is not supported by the specification, as originally filed. The same applies to dependent claims 53-56. It is suggested that said term be changed to "an identical sequence of layers".

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In claim 52, at line 5, the “substantially the same thickness” limitation is not supported by the specification, as originally filed. The same applies to dependent claims 53-56.

In claim 57, at line 3, the recitation “integral to a portion” is not supported by the specification, as originally filed. The same applies to dependent claims 58 and 59.

In claim 57, at line 6, the term “identical sequences of layers”, i.e., plural identical sequences, is not supported by the specification, as originally filed. The same applies to dependent claims 58 and 59. It is suggested that said term be changed to “an identical sequence of layers”.

In claim 57, at line 6, the “substantially the same thickness” limitation is not supported by the specification, as originally filed. The same applies to dependent claims 58 and 59.

In claim 60, at line 3, the recitation “integral to a portion” is not supported by the specification, as originally filed. The same applies to dependent claims 61-64.

In claim 60, at lines 10-11, the term “identical sequences of layers”, i.e., plural identical sequences, is not supported by the specification, as originally filed. The same applies to dependent claims 61-64. It is suggested that said term be changed to “an identical sequence of layers”.

In claim 60, at line 11, the “substantially the same thickness” limitation is not supported by the specification, as originally filed. The same applies to dependent claims 61-64.

In claim 65, at line 8, the term “identical sequences of layers”, i.e., plural identical sequences, is not supported by the specification, as originally filed. The same applies to dependent claims 66 and 67. It is suggested that said term be changed to “an identical sequence of layers”.

In claim 65, at line 9, the “substantially the same thickness” limitation is not supported by the specification, as originally filed. The same applies to dependent claims 66 and 67.

In claim 67, at line 2, the range “at least one cell” for a cell made from GaAs is not supported by the specification, as originally filed

In claim 67, at line 2, the range “as least in part” for the GaAs fabrication is not supported by the specification, as originally filed.

In claim 68, at line 7, the term “identical sequences of layers”, i.e., plural identical sequences, is not supported by the specification, as originally filed. The same applies to dependent claims 69-76. It is suggested that said term be changed to “an identical sequence of layers”.

In claim 68, at line 7, the “substantially the same thickness” limitation is not supported by the specification, as originally filed. The same applies to dependent claims 69-76.

In claim 77, at line 7, the term “identical sequences of layers”, i.e., plural identical sequences, is not supported by the specification, as originally filed. The same applies to dependent claims 78-87. It is suggested that said term be changed to “an identical sequence of layers”.

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In claim 77, at line 8, the "substantially the same thickness" limitation is not supported by the specification, as originally filed. The same applies to dependent claims 78-87.

In claim 88, at line 8, the term "identical sequences of layers", i.e., plural identical sequences, is not supported by the specification, as originally filed. The same applies to dependent claims 89-92. It is suggested that said term be changed to "an identical sequence of layers".

In claim 88, at line 8, the "substantially the same thickness" limitation is not supported by the specification, as originally filed. The same applies to dependent claims 89-92.

In claim 93, at line 7, the term "identical sequences of layers", i.e., plural identical sequences, is not supported by the specification, as originally filed. The same applies to dependent claims 94-98. It is suggested that said term be changed to "an identical sequence of layers".

In claim 93, at lines 7-8, the "substantially the same thickness" limitation is not supported by the specification, as originally filed. The same applies to dependent claims 94-98.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 48-98 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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In claim 48, at line 7, it is not clear what is to be encompassed by the term "substantially the same thickness". The same applies to dependent claims 49-51.

In claim 52, at line 5, it is not clear what is to be encompassed by the term "substantially the same thickness". The same applies to dependent claims 53-56.

In claim 57, at line 6, it is not clear what is to be encompassed by the term "substantially the same thickness". The same applies to dependent claims 58 and 59.

In claim 60, at line 11, it is not clear what is to be encompassed by the term "substantially the same thickness". The same applies to dependent claims 61-64.

In claim 65, at line 9, it is not clear what is to be encompassed by the term "substantially the same thickness". The same applies to dependent claims 66 and 67.

In claim 68, at line 7, it is not clear what is to be encompassed by the term "substantially the same thickness". The same applies to dependent claims 69-76.

In claim 75, at line 2, it appears that the word "as" should be changed to "and".

In claim 77, at line 6, it is not clear which cell is being referred to by the term "said cell". The same applies to dependent claims 78-87.

In claim 77, at line 8, it is not clear what is to be encompassed by the term "substantially the same thickness". The same applies to dependent claims 78-87.

In claim 68, at line 2, it appears that the word "as" should be changed to "and".

In claim 88, at line 8, it is not clear what is to be encompassed by the term "substantially the same thickness". The same applies to dependent claims 89-92.

In claim 93, at lines 7-8, it is not clear what is to be encompassed by the term "substantially the same thickness". The same applies to dependent claims 94-98.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 48-66, 68-70, 72, 73, 75-78, 80, 84, 86-90, and 92-98 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 9-64397, herein referred to as JP '397.

As seen in Figure 2, JP '397 teaches a solar cell module comprising a multijunction solar cell (201) including first (204A,205A,206A) and second (204B,205B,206B) subcells on a substrate (203); and bypass diode (202) that is integral to the first solar cell by way of common layer (205A), wherein said bypass diode reads on the instant means integral to a portion of the first solar cell for passing current when the multijunction solar cell is shaded (see also paragraphs 0031, 0036, and 0041-0043). As seen in Figure 2, the multijunction solar cell (201) is formed on a first portion of the substrate (203) and the bypass diode (202) is formed next to the multijunction solar cell (201) on a second portion of the substrate (203). The diode (202) and the multijunction solar cell (201) share layers (205A) and (204B) that are epitaxially grown in the same process (see paragraph 0042). As seen in Figure 2, the diode (202) is connected across the first and second solar cells to protect the cells from reverse biasing (see also paragraph 0036). The diode (202) can have a Schottky contact (see paragraph 0055). The substrate (203) can be glass coated with a metal or ITO coating (see paragraph 0066), and said metal or ITO coating then reads on the instant lateral conduction layer.

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With respect to the instant limitation that the instant means and first subcell have identical sequences of layers with substantially the same thickness, it is seen that JP '397's multijunction solar cell solar cell in Figure 1 has transparent electrode (107) followed by collection electrode (108). This is the same sequence as in the bypass diode, which has transparent electrode (107D) followed by collection electrode (108D). JP '397's multijunction solar cell and bypass diode form an integral semiconductor body on the substrate (103). Since JP '397 teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

Claims 48-66, 68-70, 72, 73-78, 80, 84-90, and 92-98 are rejected under 35 U.S.C. 102(b) as being anticipated by Taylor, GB 2346010 A. See Figures 1c and 1d and pages 5-6 of Taylor, which set forth the features of the instant solar cell semiconductor device. Said Figures 1c and 1d of Taylor clearly show the first subcell (5) and the protection diode (11) have the same sequence of layers with the same thickness. Since Taylor teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

12. Claims 48-59 and 65-92 are rejected under 35 U.S.C. 102(b) as being anticipated by Ho et al, WO 99/62125. See Figure 14B which has the instant multijunction solar cell with Ge substrate, and GaAs (1412,1414,1416) and GaInP (1422,1424,1426) solar cells, and integral bypass diode (1410) that is integral with a portion of the GaAs solar cell and laterally spaced therefrom. The GaAs solar cell and aid integral bypass diode have the same sequence of layers with the same thickness.

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Since Ho et al teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 48-98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taylor, GB 2346010 A, in view of Marvin et al, "Evaluation of multijunction solar cell performance in radiation environments, Conference Record of the 28th Photovoltaic Specialists Conference, pages 1102-1105, published 15-22 September 2000, and Lillington et al, U.S. Patent 5,853,497.

See Figures 1c and 1d and pages 5-6 of Taylor, which set forth the features of the instant solar cell semiconductor device. Said Figures 1c and 1d of Taylor clearly show the first subcell (5) and the protection diode (11) have the same sequence of layers with the same thickness. Taylor teaches that its substrate (1) can be GaAs (see page 5, line 4). Taylor does not specifically teach that its substrate (1) can be Ge, and that its solar cell (5) is GaAs and its solar cell (2) is InGaP. Marvin et al teaches the conventional GaInP/GaAs/Ge two junction device wherein the Ge is the substrate (see the entire document). Lillington et al is relied upon for showing what is well-known in the art, i.e., that GaInP/GaAs can be grown on either a GaAs substrate or a Ge substrate (see col. 1, line 65 through col. 2, line 16). It would have been obvious to one

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of ordinary skill in the art at the time the invention was made to have used a Ge substrate in Taylor's multijunction solar cell in place of the GaAs exemplified by Taylor, and to have used GaInP and GaAs for Taylor's solar cells because GaInP/GaAs can be grown on either a GaAs substrate or a Ge substrate as shown by Lillington et al, and because the GaInP/GaAs/Ge two junction device wherein the Ge is the substrate is conventional in the art, as shown by Marvin et al.

15. Claims 48-98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ho et al, WO 99/62125.

See Figure 14B which has the instant multijunction solar cell with Ge substrate, and GaAs (1412,1414,1416) and GaInP (1422,1424,1426) solar cells, and integral bypass diode (1410) that is integral with a portion of the GaAs solar cell and laterally spaced therefrom. The GaAs solar cell and aid integral bypass diode have the same sequence of layers with the same thickness. Ho et al's electrical interconnector C-clamp (1442) corresponds to the metal layer in independent claims 60 and 93. When the C-clamp is connected to front metal (1440) it will be a layer on said (1440). Likewise, when the C-clamp is connected to the back metal (1430), it will be a layer on said (1430). Indeed, Ho et al's Figure 11 shows how the C-clamp (1102) provides for a layer on front metal (702) and a layer on back metal (802). Ho et al teaches the limitations of the instant claims other than the difference which is discussed below.

Ho et al does not specifically teach that said electrical interconnector C-clamp is metal. However, in the absence of anything unexpected, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used metal for

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Ho et al's electrical interconnector C-clamp because said C-clamp is electrically conductive. Ho et al's metal C-clamp 1442 is a layer in metal layer in the device since it forms layers on said front metal 1440 and said back metal 1430.

Response to Arguments

16. Applicant's arguments filed May 23, 2005 and July 5, 2005 have been fully considered but they are not persuasive.

With respect to JP '397, Applicant argues that the bypass diode in Figure 2 comprises elements 209, 210, 208D, and 207D that are not in the solar cell, and that the solar cell contains elements 207, 206B, 205B, 206A, and 204A that are not contained in the bypass diode. However, this argument is not deemed to be persuasive because the recitation, for example, in instant claim 48 that "said means and said first subcell have identical sequences of layers with substantially the same thickness" does not require that all layers in the subcell are identical with all layers of the means. The transparent electrode (207) followed by collection electrode (208) of the subcells in Figure 2 is of the same sequence as transparent electrode (207) followed by collection electrode (208) in the means. The layers (207, 208) are part of the first subcell (204A, 205A, 206A) in said Figure 2 because said layers (207, 208) are part of the overall multijunction solar cell (201).

Applicant cites the description of Taylor at page 2, line 7, of the instant specification and Figures 4a and 4b of Taylor and argues that Taylor relies on an external connection from a diode to a separate solar cell. Applicant argues that in the instant invention, there is an internal connection between the diode and the solar cell,

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as explained at page 7, line 33 through page 8, line 2 of the instant specification.

However, this argument is not deemed to be persuasive because Taylor's protective diode 11 and solar cell 5 share layer 7, which is electrically conductive and thus, the protective diode 11 and solar cell 5 are electrically connected internally (see Figures 1a and 1c; and page 5, lines 15-16). If Taylor's protective diode was not electrically connected to the multijunction solar cell, then the protective diode would not have any function in the device. The additional external connection that Taylor makes to another multijunction solar cell is not excluded by the instant claims.

Applicant argues that in instant claim 48 the first subcell overlies the second subcell and thus, the first subcell is the bottom subcell. Applicant argues that Ho et al discloses a diode that is not integral to the bottom subcell. However, this argument is not deemed to be persuasive because instant claim 48 is silent concerning a bottom subcell. Ho et al's GaAs subcell in Figure 14B reads on the instant first subcell; and the GaInP subcell that overlies said GaAs subcell reads on the instant second subcell. Alternatively, the combination of Ho et al's Ge cell and GaAs cell reads on the instant first subcell. In this case, the combination of the Ge cell and GaAs cell is a bottom cell. Ho et al's bypass diode 1410 is integral with the GaAs portion of the bottom cell. In a further alternative, said GaAs subcell is a bottom subcell that is clearly formed on germanium substrate 1402. Said GaAs subcell is a bottom subcell because it is the solar cell at the bottom of layers including layers 1412 to 1432, which are formed on the Ge substrate.

Applicant argues that Figure 15 clearly shows that the bottom subcell is below the tunnel diode. Applicant argues that "[w]ith respect to [Ho et al's] Figure 14B, that means the bottom subcell is layers 1404 and 1402", and that "[t]he diode is not integral with layers 1404 and 1402 in that the diode shares no common layers with 1404 and 1402." The Examiner disagrees. Ho et al's GaAs subcell (layers 1412 to 1416) in Figure 14B is "a bottom subcell" that is clearly formed on germanium substrate 1402. Said GaAs subcell is "a bottom subcell" because it is the solar cell at the bottom of the stack of layers including layers 1412 to 1432, which are formed on the Ge substrate. Claim 52 is so broadly written that there is nothing in instant claim 52 that excludes a bottom subcell being on a substrate which may or may not have a subcell.

With respect to claim 57, Applicant argues that they have amended this claim so as to recite direct electrical connection and so as to clearly define which subcell is to be considered the first subcell. However, this argument is not deemed to be persuasive because, as noted in the immediately preceding paragraph, Ho et al's GaAs subcell (layers 1412 to 1416) in Figure 14B is "a bottom subcell" that is clearly formed on germanium substrate 1402, and thus, also reads on the instant "first" subcell. There is direct electrical connection between the GaAs Base/Buffer N layer of the diode (1410) and the GaAs Base/Buffer N base layer of the GaAs solar cell via the tunnel diode N++ layer (1408).

With respect to claim 60, Applicant argues that the C-clamp 1442 is not a layer and is described by Ho et al at page 8, line 20, as being an interconnect. Applicant argues that the C-clamp is external to the structure 1400 in that it is not formed or

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assembled in the same manner as layers 1402 through 1432. However, these arguments are not deemed to be persuasive because, as clearly seen in Ho et al's Figure 14B, C-clamp 1442 is a layer. Indeed, when the C-clamp is connected to front metal 1440, there will be a layer on said 1440. Likewise, when the C-clamp is connected to the back metal 1430, there will be a layer on said 1430. Since the C-clamp is making an electrical connection, a skilled artisan would use a conductive material, such as a metal, for the C-clamp. Ho et al's Figure 11 shows how the C-clamp 1102 provides for a layer on front metal 702 and a layer on back metal 802. Ho et al's metal C-clamp 1442 is a metal layer in the device since it forms layers on said front metal 1440 and said back metal 1430.

With respect to the 35 USC 103(a) rejections, Applicant argues that Taylor and Ho et al fail to render obvious the instant claim for the reasons that Applicant has argued above. However, the Examiner maintains, for the reasons set forth above, that Taylor and Ho et al also render obvious the instant claim.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 571-272-1338. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

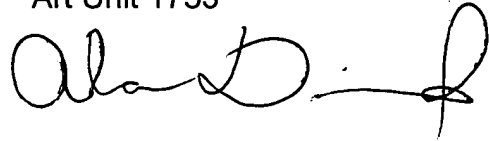
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alan Diamond
September 12, 2005

Alan Diamond
Primary Examiner
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A handwritten signature in black ink, appearing to read 'Alan Diamond', with a stylized flourish at the end.